

that they would be useless for the purpose suggested by Prof. Lefroy. Mr. Hamm entirely agrees with this conclusion."

The opinion of Mr. J. E. Collin, F.E.S., a well-known student of and authority upon British Diptera, is precisely the same as that of Prof. Poulton; like the present writer, Mr. Collin has never met with even a solitary case of *Scatophaga* preying upon *Calliphora*.

Finally, Lt.-Col. J. W. Yerbury, whose experience as a collector of our native Diptera is absolutely unique, and who speaks with authority derived from thirty years' observation of predaceous flies in the field, while admitting that such a thing may occasionally happen, has never observed an instance of the Blow-fly being attacked by any species of *Scatophaga*, and therefore considers Prof. Lefroy's assertion to be at variance with facts.

It would appear, then, that if it be possible to discover a natural means of control for the Sheep Blow-fly pest in Australia, we must look elsewhere than to the Yellow Dung-fly to find it. In any case, quite apart from the negative evidence adduced above, which seems to the writer to be reasonably conclusive, it is difficult to understand what advantage could possibly accrue from the introduction into Australia of a British insect, which, though abundant in these islands, is scarcely more so than its supposed victim.

VII.—*The "Cirripede" Plumulites in the Middle Ordovician Rocks of Esthonia.* By THOMAS H. WITHERS, F.G.S.

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THROUGH the researches of F. Schmidt (1881–82), and the later work of E. Koken (1897), J. H. Bonnema (1909), R. S. Bassler (1911), and H. Bekker (1919), the Kuckers Stage (C² of Schmidt) of the Middle Ordovician rocks of Esthonia and its fauna, particularly the Gastropoda, Trilobita, Ostracoda, and Polyzoa, are fairly well known. The Kuckers Stage is represented in the neighbourhood of Kuckers, 10 km. N.W. of Jewe Station, Esthonia, by a white or greyish-yellow limestone or marl, with intercalated layers of soft bituminous shale generally of a rusty-brown or amber colour. *Phacops (Chasmops) odini* is the characteristic fossil, but numerous other Trilobites occur, and

there is an abundant fauna of Brachiopods, Gastropods, Orthoceratites, Ostracods, Crinoids, Cystids, and Polyzoa.

So far the genus *Plumulites* has not been recorded from the Kuckers Shale or from Esthonia, although it has a wide geographical distribution and comprises several species ranging through the Ordovician, Silurian, and Devonian rocks. It is but rarely that the plates are found in their natural position, and in consequence most species are known by detached plates only. In many cases the species have been described either under *Turrilepas* or *Plumulites* (see Withers, 1915, p. 122) in the belief that those two genera are synonymous, as indeed they are regarded even in recent text-books.

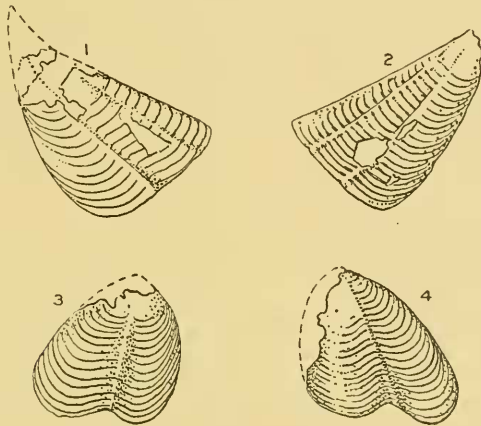
Mr. Bekker has collected and has recently submitted to me thirteen pieces of the bituminous Kuckers Shale on which are exhibited a number of plates which undoubtedly belong to the genus *Plumulites*, s. str., but cannot be referred with our present knowledge to any of the known species.

GENUS PLUMULITES, Barrande.

The shell of this genus was probably blade-shaped and composed of four vertical columns of plates, although in most cases where the shell is at all complete the four columns are flattened and spread out; the plates themselves are extremely thin. The two admedian columns of plates are heart-shaped, and, although flattened out in the fossils, were in life probably bent at an angle along the median fold observable in all these plates; and, although they appear merely to abut along the margin of their inner lobe, they probably overlapped to some extent, but they do not alternate with, or intersect, each other; the outer lobe of each plate intersects the outer plates on either side. The outer kite-shaped plates, as do the admedian plates, overlap each other from behind forward; they are slightly curved distalwards and have a strong narrow median fold, and usually a much narrower submarginal fold on either side; these two latter folds probably mark the position of the plates above and below. Plates in which the apical part is broadly rounded and the growth-lines form a series of rings at the apex ("cancellated" plates of Barrande) have been found associated with the other plates, and these cancellated plates were probably modified plates forming the basal or proximal extremity of the shell.

Plumulites esthonicus, sp. n.

Diagnosis. A *Plumulites* with small plates, the admedian plates under 4 mm. in height, and the outer plates about 6 mm., the growth-lines very closely disposed, 6 to 7 to a millimetre in the outer plates, the admedian plates have the proximal margin deeply excavated in the middle, and the plate is divided into two lobes by a wide and obscure apico-proximal fold, the inner lobe being extremely protuberant from the apex; outer plates with the outer proximal angle broadly rounded, and with the median fold nearer to the outer margin.

*Plumulites esthonicus*, sp. n.

Figs. 1 & 2.—Outer or "kite-shaped" plates. $\times 6$ diam.

Figs. 3 & 4.—Admedian or "heart-shaped" plates. $\times 6$ diam.

(Figures drawn by Miss G. M. Woodward.)

Horizon and locality. Middle Ordovician, Kuckers Stage (C² of Schmidt): Jaerve, nr. Kuckers, 10 km. N.W. of Jewe Station, Esthonia.

Collection. The holotype and one of the figured paratypes (fig. 3) remain in the collection of Mr. H. Bekker, but they will ultimately be presented with other specimens to the Geological Museum of the University of Tartu (Dorpat); the two remaining figured paratypes (figs. 2, 4) and two

other specimens have been presented to the Geological Department of the British Museum, registered In. 20588-In. 20591.

Holotype. The outer plate (fig. 1).

Material. Thirteen pieces of shale with several admedian and outer plates.

Description. The plates are all much flattened and imperfect, and are preserved as mere films standing out white on the rusty-brown shale; they are of two kinds, the admedian heart-shaped plates and the outer kite-shaped plates. None of the so-called "cancellated" plates have been noticed.

Admedian plates roughly heart-shaped, broad, short, subtriangular, with the apex directed inwards, and a rather wide ill-defined fold extending from the apex to the excavated portion of the proximal margin, the largest plate having a height of 3.8 mm. Proximal margin sinuous, the middle portion deeply excavated; inner (fixed) margin rounded and markedly protuberant from the apex, much more so than is the outer margin. The growth-lines are very closely disposed, in some measure no doubt due to crushing, and they are directed upwards on the margins, but to a greater extent on the inner margin.

Outer plates kite-shaped, somewhat curved distally with pointed apex, and a narrow submedian fold extending the whole length of the plate and situated slightly nearer to the outer margin, and there is a similar but narrower fold near and parallel to the inner margin. The proximal margin is slightly sinuous, being slightly excavated in the middle, the outer proximal angle is broadly and regularly rounded, and the inner proximal angle narrowly rounded; inner margin very slightly concave, the proximal half almost straight; outer margin slightly convex. Growth-lines closely disposed, 6-7 to a millimetre, equidistant, crossing the median apico-proximal fold at right angles, slightly concave on the inner half of the plate and a little upturned at the inner margin, and on the outer half they are broadly curved upwards, and towards the outer margin are more crowded together.

Remarks, and comparison with other species. The detached plates of *Plumulites* are readily distinguished from the probably homologous admedian and outer plates of *Turrilepas*. In *Turrilepas* the plates are much thicker, the admedian plates have more laterally produced lobes and are consequently more saddle-shaped, and the outer plates are not acutely tapering at the apex, nor have they the median

longitudinal fold so characteristic of the outer plates of *Plumulites*.

Plumulites esthonicus appears to agree most closely with *P. rastritum*, Moberg (1914, p. 493, figs. 7, 8), from the Ordovician (*Rastrites skiffer*) of Sweden, and *P. peachi*, Nicholson & Etheridge (1880, p. 301, pl. xx. figs. 8-10; also Reed, 1908, p. 519, pl., figs. 1-5), from the Upper Ordovician (Ardmillan Series) of Scotland. From *P. rastritum* it differs in the admedian plates by the more rounded and protuberant inner lobe, and in the outer plates by the longitudinal fold being nearer to the outer margin instead of to the inner margin. From *P. peachi* the admedian plates differ in having the inner lobe more protuberant, the margin being more fully rounded to the apex, and in the outer plates the growth-lines of the outer lobe are more regularly curved and consequently the outer proximal angle is more regularly rounded; the growth-lines are more closely disposed, and none of the known plates attain to more than one-third the size of the largest-known plates of *P. peachi*.

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